SECTION 15073
PRESSURE / LEAK TESTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.2 SUMMARY

A. This Section includes pressure/leak testing of piping systems.

1.3 REFERENCES

A. American Society of Heating, Refrigerating and Air Conditioning Engineers Inc. (ASHRAE)
   1. ASHRAE 15 “Safety Code for Mechanical Refrigeration”
   2. ASME B31.5A-94, “Refrigeration Piping”

B. American Society of Mechanical Engineers (ASME)
   1. ASME B31.3-99, “Process Piping”
   2. ASME B31.9-96, “Building Service Piping”
   3. ASME B31.5A-94, “Refrigeration Piping”
   4. ASME Section VIII, Division 1, “Requirements for Pressure Vessel fabricated by Welding”.

C. Southern Building Code Congress International Inc.
   1. International Plumbing Code (IPC-97).

D. International Association of Plumbing & Mechanical Officials
   1. Uniform Plumbing Code (UPC-94).

E. National Fire Protection Association (NFPA).
   1. NFPA 13 “Installation of Sprinkler Systems (1996)

1.4 DEFINITIONS

A. Dry Oil-free Compressed Air (CA): compressed air, oil free, with -40^0 to -75^0 F dew point at atmospheric pressure.

1.5 SUBMITTALS FOR APPROVAL

A. Test records for each piping system prepared during pressure/leak testing, indicating date of test, identification of piping system tested, test media, test pressure, and certification of results.

1.6 QUALITY ASSURANCE

A. Calibration Data

B. Prepare test records for each system during pressure/leak testing, including date of test, identification of piping system tested, test media, test pressure, and certification of results.

Individual test records need not be retained if certification that piping has satisfactorily passed pressure/leak testing is retained.

C. Written reports of tests specified in part 3 of this section.
   1. Test procedure used
   2. Test requirements that comply with requirements
   3. Failed test results and corrective action taken

1.7 SEQUENCING

A. Perform testing after completion of installation.

B. Perform hydrostatic testing of potable water systems before cleaning and disinfection.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Calibration shall be performed by a certified, independent agency.

B. Calibration Date: maximum 12 months prior to test.

C. Use test equipment with label indicating serial number, calibration date, name of firm or laboratory performing calibration.

D. Construction Manager's (CM) representative will examine test equipment prior to test. CM representative may require that test equipment be submitted to CM for a calibration check. Test equipment failing calibration check must be submitted to an approved testing laboratory for proper calibration prior to use.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine system installation for compliance with drawings and specifications.

B. Ensure pressure-relief valves have been inspected and set at required pressure by Subcontractor.

C. Ensure that rupture discs have been properly installed.

D. Examine system for leaks at valves, flanges, welds, connections, and joints.

E. Examine piping system for defective, broken, or cracked piping and fittings.

3.2 PREPARATION

A. Isolate or replace with spool pieces vessels, pumps, instruments, controls, safety valves, relief valves, and other equipment items rated for pressures below test pressure.

B. Provide temporary overpressurization protection devices between pressure source and test equipment.
   1. For Class A - Pneumatic Test, set temporary overpressurization protection devices at test pressure plus lesser of 50 psi or 10% of test pressure.

2. For Class B - Hydrostatic Test, set temporary overpressurization protection devices at 130% of test pressure.

C. Disconnect or isolate by blind flanges or other means equipment that is not to be tested. Valves may be used provided valves are rated for test pressures.

D. Maintain joints, including welds and bonds, uninsulated and exposed for examination during testing. Joints previously pressure tested may be insulated or covered.

E. Provide additional temporary supports as necessary to support test media [when weight of test media exceeds weight of design system fluid].

F. Clear test area of personnel not involved with pneumatic testing.

G. Connect test instrumentation.

3.3 REPAIR/RESTORATION

A. Repair all unacceptable leaks and retest repaired joints until test requirements have been satisfied.

B. Remove testing instrumentation and devices.

C. Replace devices removed under part 3.2.

3.4 CLASS A - PNEUMATIC TEST

A. Test Pressure
1. For piping 6 in. and smaller, use test pressure that is 110% of design pressure or 50 psig, whichever is greater.
2. For piping 8 in. and larger with design pressures of 45 psig and less, use test pressure that is 110% of design pressure but in no case greater than 50 psig.
3. For piping 8 in. and larger with design pressures greater than 45 psig, hydrostatically test piping per Class B test procedures.

B. Preliminary Leak Test Procedure
1. Gradually pressurize piping system to 25 psig.
2. Maintain 25-psig pressure for a minimum of 10 min.
3. Visually examine valves, flanges, welds, joints, and connections for major leaks.

C. Final Leak Test Procedure (test pressures of 50 psig and less)
1. Gradually pressurize piping system to test pressure.
2. Maintain test pressure for a minimum of 10 min.
3. Soap test welds, joints, and connections while system is at test pressure.
4. Depressurize system.

D. Final Leak Test Procedure (test pressures exceeding 50 psig)
1. Gradually pressurize system to 50% of test pressure.
2. Increase pressure in steps of 10% of test pressure until test pressure is reached.
3. Maintain test pressure for a minimum of 10 min.
4. Reduce pressure to design pressure.
5. Soap test welds, joints, and connections while system is at design pressure.
6. Depressurize system.

E. Reconnect instruments and equipment and retest connections at maximum operating pressure.

F. Acceptance Criteria: No continuous bubble formation is allowed.

G. Test Medium for Class A tests are listed in Table 1 below.

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Table 1

Section	Service	Test Medium
15108	Natural Gas	Dry Oil-Free Compressed Air
15112	Compressed Air	Dry Oil-Free Compressed Air
15125	Refrigerant DX piping	Dry Oil-Free Compressed Air
15899	Process Exhaust	Dry Oil-Free Compressed Air

3.5 CLASS B - HYDROSTATIC TEST

A. Special Requirements for Potable Water Systems
   1. Test systems conveying potable water with dedicated and controlled test equipment that is used only on systems conveying potable water.
   2. Equipment includes pumps, pressure gages, hoses, pipes, caps, and other test equipment that contacts potable water.
   3. Contractor to supply all equipment and materials required for test.

B. Leakage test procedures for Section 15425, “Process Waste Water Diversion Tanks” shall be in accordance with ASME Section VIII, Division 1 hydrostatic test procedures.

C. Test Procedure
   1. Fill and vent system with required test medium.
   2. Incrementally pressurize system to test pressure.
   3. Maintain test pressure for minimum 10 min.
   4. Examine valves, flanges, welds, joints, and connections for leaks.
   5. Drain test media from system.
   6. Dispose of media per CM instructions.
   7. Reconnect instruments and equipment.
   8. Refill system with test media, pressurize to maximum operating pressure, and examine valves, flanges, welds, joints, and connections for leaks.

D. Acceptance Criteria: No leakage is permitted at welds, brazed joints, soldered joints, compression fittings, or threaded joints. No leakage is acceptable at valves and gaskets unless specified otherwise. No continuous bubble formation is allowed.

E. Hydrostatic leakage testing of Section 15425, “Process Waste Water Diversion Tanks” shall be accordance to ASME Section VIII, Division 1 procedures.

F. Test Medium for Class B tests are listed in Table 2 below.

Table 2

Section	Service	Test medium
15103	Sanitary Water Hot (SWH) and Cold (SWC)	Sanitary Water
15104	Technical Equipment Cooling Water (DI and GLY)	Sanitary Water
15106	Chilled Water (CHWS, CHWR)	Sanitary Water
	Condenser Water (CNDS, CNDR)	Sanitary Water
	Tower Water (TWS, TWR)	Sanitary Water
	Process Water (PW)	Sanitary Water
	Heating Water (HWS, HWR)	Sanitary Water
15425	Process Waste Water Diversion Tanks	Sanitary Water
15425	Process Drain Storage Tank	Sanitary Water

3.6 CLASS C - WATER TEST (DRAIN)

A. Process and Chemical Drains
   1. Subject drain to 20 ft of water head pressure.
   2. Examine joints and connections for leaks. No continuous bubble formation is allowed.

B. Building Drain and Vent Systems
   1. Test per Uniform Plumbing Code standards.
   2. Perform either smoke or peppermint final test.

C. Building Sewer: Test per Uniform Plumbing Code (UPC) and IPC standards.

D. Test Medium for Class C tests are listed in Table 3 below.

Table 3

Section	Service	Test medium
15109	Sanitary Sewer & Storm Drains within Bldg.	Sanitary Water
15110	Process Drains	Sanitary Water

3.7 CLASS D - VACUUM TEST

A. Class D tests are not applicable on this project.

3.8 CLASS E - SPECIAL TESTS

A. Class E tests are special tests required by codes or as described in specifications or on drawings.

B. See applicable code sections for test pressure, test media, and test procedure.

C. Governing codes for Class E special tests are listed in Table 4 below.

Table 4

Section	Service	Reference Code
15300	Fire Suppression System	NFPA 13
15501	HVAC Systems, Installation & Equipment as it refers to refrigerant Piping (Section 2.3, Split System Air conditioning unit)	ASME B31.5, ASHRAE 15

3.9 DEMONSTRATION

A. Perform tests in presence of Construction Manager representative.

B. Provide Construction Manager with the option of witnessing tests.

3.10 TEST PRESSURE TOLERANCE

A. Use test pressure tolerance of +5 psig and -0 psig unless otherwise indicated.

END OF SECTION 15073